

RCRA PERMIT
ADMINISTRATIVE RECORD
ITEM NUMBER _____
TOTAL NUMBER OF PAGES _____

WA 2917
4-2-93
8a

PROJECT MEMORANDUM

DATE: April 2, 1993
TO: Joe Depner, Hydrogeologist
FROM: Nels Cone, Chemist
SUBJECT: DATA VALIDATION OF ANALYTICAL RESULTS FROM PIER 91 RCRA FACILITY INVESTIGATION, PROJECT 624878, DATA SET #8B

FILE COPY

During the period of January 18 to March 3, 1993, four soil samples were collected by Burlington Environmental Inc. personnel. These samples were submitted to Sound Analytical Services of Tacoma, Washington for volatile organic (EPA SW-846 Method 8240), semivolatile organic (EPA SW-846 Method 8270), and Total Petroleum Hydrocarbon (EPA SW-846 Methods 418.1 and 8015) analyses (work orders 29663, 29912, and 30645). I performed a review of the analytical results for samples CP-115B3-SD, CP-122B-DW, CP-122B-2-4, and CP-122B-6-8.

Properly completed chain-of-custody forms were included, along with documented signatures from field to laboratory receipt. The samples were shown as having been properly iced and received in good condition. Holding times were clearly written and evaluated according to regulatory protocol (*National Functional Guidelines for Organic Data Review*, USEPA, 1990). The samples received the analyses as required by the Quality Assurance Project Plan (QAPP), and laboratory extraction/analysis times met the established guidelines.

Most matrix spike/ matrix spike duplicate analyses displayed analytical accuracy within required guidelines, except in the case of TPH (8015) analyses. Method (blank) spikes were then performed and all recoveries met required QC limits. When provided, duplicate analysis met requisite precision criteria. Method blank data met acceptable quality control (QC) limits. Sample results received the appropriate "B" data qualifier flags when lab contaminants (i.e., methylene chloride, di-n-butylphthalate, toluene, or trichloroethene) were found in the method blanks.

Sample CP-122B-2-4 was diluted to ensure target analytes were within instrument calibration range. As a result of required dilution, elevated detection limits are reported for semivolatile organic analysis. For TPH (8015) analysis of CP-122B-2-4, surrogates were also out of QC limits due to the required dilution. Supporting QC documentation for TPH analysis was provided in the form of composite calibration working standard data. Overall, the data quality objectives as defined in Table F-2 of the QAPP are met. Proper data qualifier flags accompanied the analytical results as needed. Accordingly, this data set can be considered valid for its intended use.

NC/rlk/b46:2192b.mem

USEPA RCRA



3012498

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

March 3, 1993

To: Burlington Environmental Engineering

PROJECT NUMBER: 624878-7304

PROJECT NAME: Pier 91

LABORATORY WORK ORDER NUMBER: 29912

The sample was taken on 1/29/93 and was received at Sound on 2/1/93. The sample was qualitatively screened for total petroleum fuel hydrocarbons in accordance with WA State DOE Method WTPH-HCID.

TOTAL PETROLEUM HYDROCARBONS

Sample 29912-1 was extracted and analyzed on 2/3/93. No contamination above the PQL's was present in the method blank. The sample was flagged X10 to note that the percent recoveries for the surrogates were not calculated due to high contaminant levels. All other QC parameters were within acceptance limits.

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Burlington Environmental Date: February 16, 1993
 Technical Services

Report On: Analysis of Liquid Lab No.: 29912

IDENTIFICATION:

Sample received on 02-01-93
Project: 624878-7304 Pier 91
Client ID: CP-115B3-SD (Top Phase)

ANALYSIS:

WTPH-HCID

Date Extracted: 2-3-93

Date Analyzed: 2-3-93

Gasoline, mg/kg > 20

(C7 - C12)

Diesel, mg/kg > 50

(> C12 - C24)

Heavy Oil, mg/kg > 100

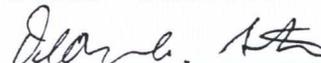
(C24+)

SURROGATE RECOVERY, %

1-chlorooctane X10

o-terphenyl X10

SOUND ANALYTICAL SERVICES



DEAN A. STROM

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

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QUALITY CONTROL REPORT

WTPH-HCID

Client: Burlington Environmental Technical Services
Lab No: 29912qc
Units: mg/kg
Date: February 16, 1993

METHOD BLANK

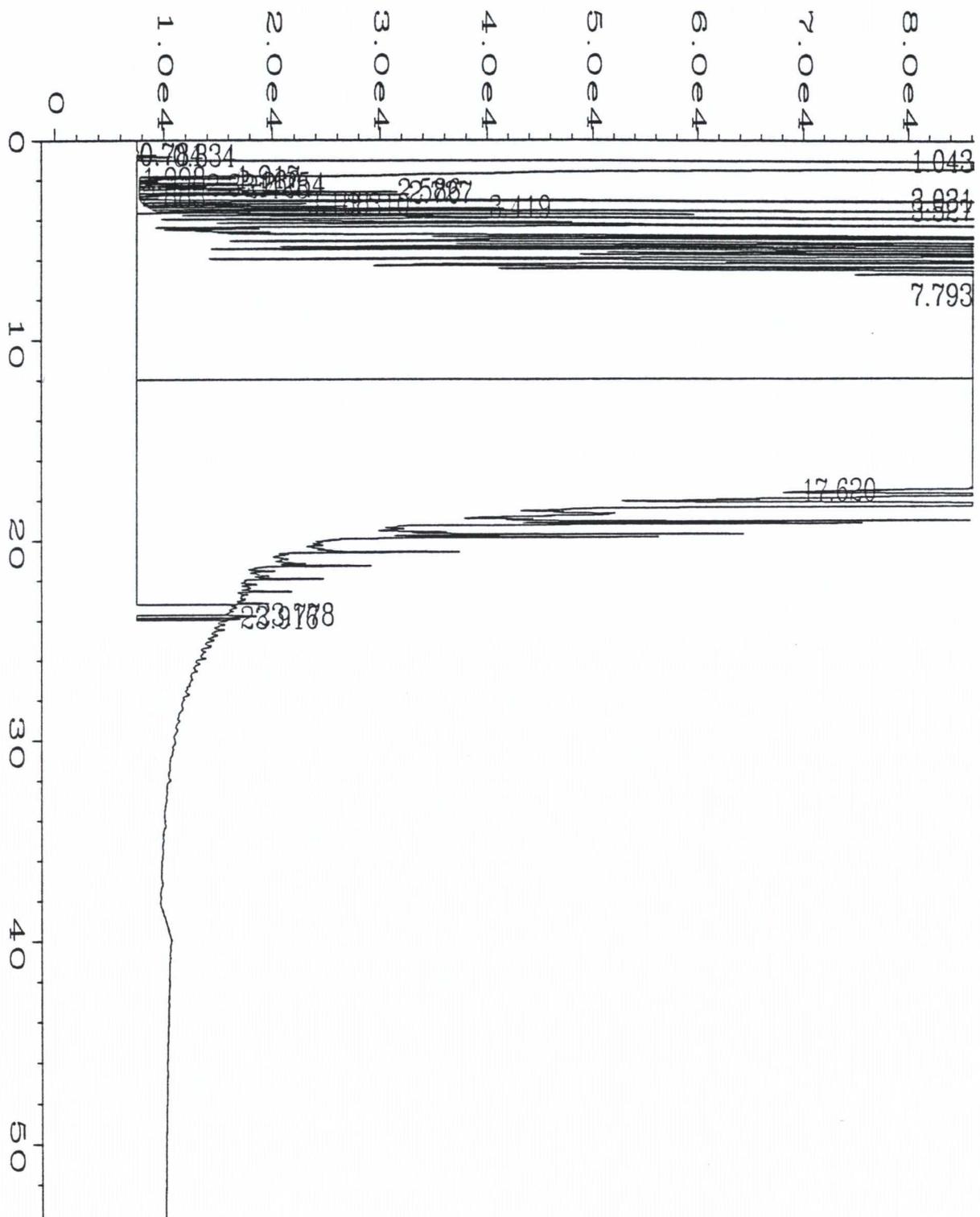
Blank No. 005F0101.D

Parameter	Blank Value	FLAGS
Gasoline (C ₇ -C ₁₂)	< 20	
Diesel (>C ₁₂ -C ₂₄)	< 50	
Heavy Petroleum Oil (C ₂₄ ⁺)	< 100	
<u>SURROGATE RECOVERY, %</u>		
1-chlorooctane	114	
o-terphenyl	107	

CHAIN OF CUSTODY

WTPH-HCID DATA PACKAGE

SAMPLE DATA



Data File Name	: C:\HPCHEM\1\DATA\020393_A\007F0201.D	Page Number	: 1
Operator	: DAS/DMW	Vial Number	: 7
Instrument	: HP 5890	Injection Number	: 1
Sample Name	: 29912-1	Sequence Line	: 2
Run Time Bar Code:		Instrument Method:	I-NC40.MTH
Acquired on	: 03 Feb 93 08:01 PM	Analysis Method	: I-HCID.MTH
Report Created on:	04 Feb 93 07:22 AM	Sample Amount	: 0
Last Recalib on	: 31 JAN 93 12:42 PM	ISTD Amount	:
Multiplier	: 1		

External Standard Report

```

Data File Name      : C:\HPCHEM\1\DATA\020393_A\007F0201.D
Operator           : DAS/DMW
Instrument          : HP 5890
Sample Name        : 29912-1
Run Time Bar Code  :
Acquired on        : 03 Feb 93 08:01 PM
Report Created on  : 04 Feb 93 07:23 AM
Last Recalib on   : 31 JAN 93 12:42 PM
Multiplier         : 1
Page Number        : 1
Vial Number        : 7
Injection Number   : 1
Sequence Line      : 2
Instrument Method   : I-NC40.MTH
Analysis Method    : I-HCID.MTH
Sample Amount      : 0
ISTD Amount        :
  
```

Sig. 1 in C:\HPCHEM\1\DATA\020393_A\007F0201.D

Ret Time	Area	Type	Width	Ref#	ng/ul	Name
7.793	1.02253E+008	HH +	0.000	1	37313.35	wtpn gasoline
17.620	1.24766E+008	HH +	0.000	1	23065.16	wtph diesel

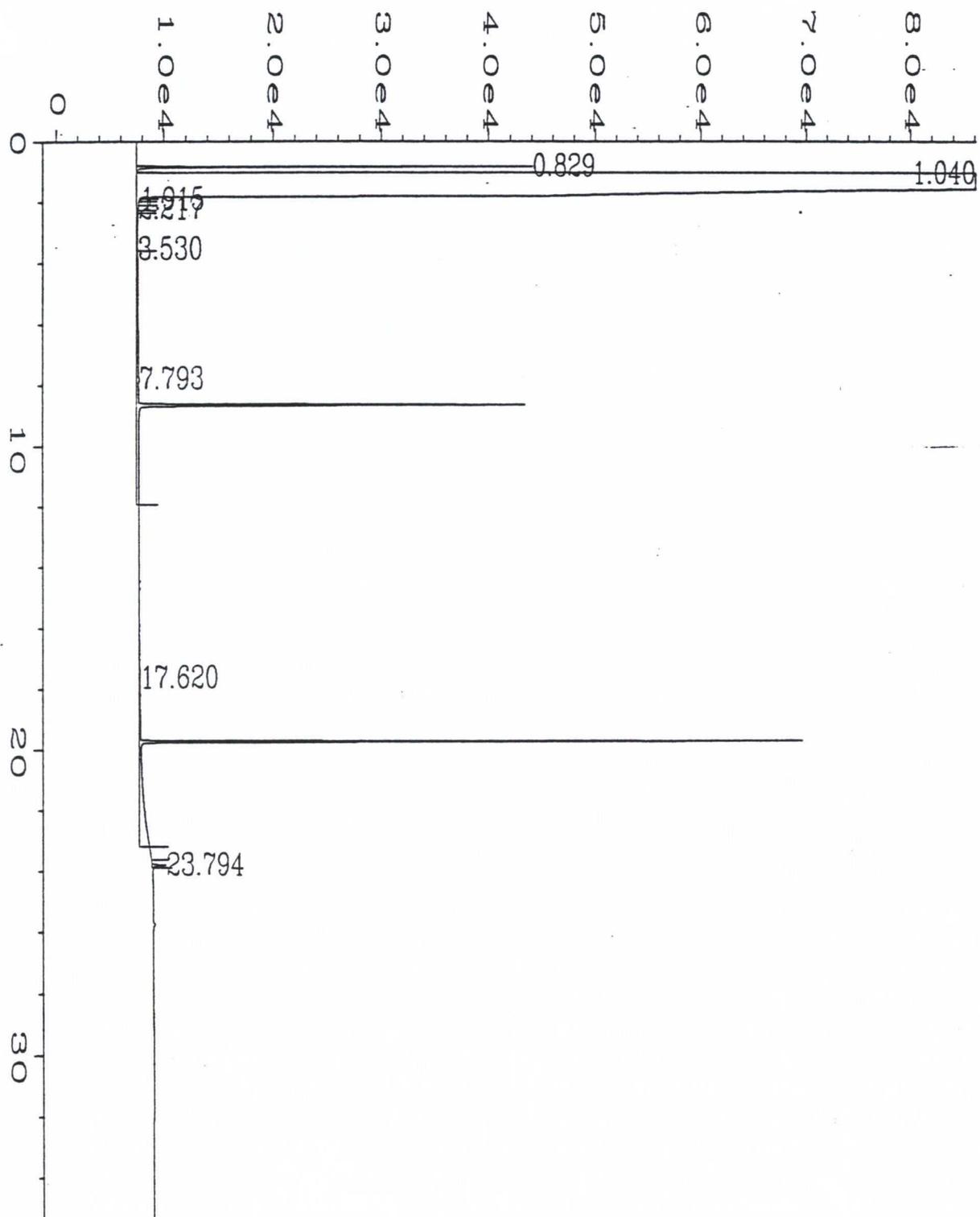
External Standard Report

Data File Name : C:\HPCHEM\1\DATA\020393_A\007F0201.D
Operator : DAS/DMW Page Number : 1
Instrument : HP 5890 Vial Number : 7
Sample Name : 29912-1 Injection Number : 1
Run Time Bar Code: Sequence Line : 2
Acquired on : 03 Feb 93 08:01 PM Instrument Method: I-NC40.MTH
Report Created on: 04 Feb 93 07:24 AM Analysis Method : I-HVOIL.MTH
Last Recalib on : 20 JAN 93 08:19 AM Sample Amount : 0
Multiplier : 1 ISTD Amount :

Sig. 1 in C:\HPCHEM\1\DATA\020393_A\007F0201.D

Ret Time	Area	Type	Width	Ref#	ng/ul	Name
28.233	1971493	BB +	0.000	1	105.945	HEAVY OIL

METHOD BLANK DATA



Data File Name	: C:\HPCHEM\1\DATA\020393_A\005F0101.D	Page Number	: 1
Operator	: DAS/DMW	Vial Number	: 5
Instrument	: HP 5890	Injection Number	: 1
Sample Name	: hcid mb	Sequence Line	: 1
Run Time Bar Code:		Instrument Method:	O-TERPH.MTH
Acquired on	: 03 Feb 93 06:37 PM	Analysis Method	: I-HCID.MTH
Report Created on:	04 Feb 93 07:21 AM	Sample Amount	: 0
Last Recalib on	: 31 JAN 93 12:42 PM	ISTD Amount	:
Multiplier	: 1		

=====
External Standard Report
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Data File Name : C:\HPCHEM\1\DATA\020393_A\005F0101.D
Operator : DAS/DMW Page Number : 1
Instrument : HP 5890 Vial Number : 5
Sample Name : hcid mb Injection Number : 1
Run Time Bar Code: Sequence Line : 1
Acquired on : 03 Feb 93 06:37 PM Instrument Method: O-TERPH.MTH
Report Created on: 04 Feb 93 07:21 AM Analysis Method : I-HCID.MTH
Last Recalib on : 31 JAN 93 12:42 PM Sample Amount : 0
Multiplier : 1 ISTD Amount :

Sig. 1 in C:\HPCHEM\1\DATA\020393_A\005F0101.D

Ret Time	Area	Type	Width	Ref#	ng/ul	Name
7.793	214669	HH +	0.000	1	-26.000	wtpn gasoline
17.620	259563	BH +	0.000	1	-60.271	wtpn diesel

External Standard Report

Data File Name : C:\HPCHEM\1\DATA\020393_a\005F0101.D
Operator : DAS/DMW Page Number : 1
Instrument : HP 5890 Vial Number : 5
Sample Name : hcid mb Injection Number : 1
Run Time Bar Code: Sequence Line : 1
Acquired on : 03 Feb 93 06:37 PM Instrument Method: O-TERPH.MTH
Report Created on: 03 Feb 93 07:18 PM Analysis Method : O-TERPH.MTH
Last Recalib on : 31 JAN 93 12:04 PM Sample Amount : 0
Multiplier : 1 ISTD Amount :

Sig. 1 in C:\HPCHEM\1\DATA\020393_a\005F0101.D

Ret Time	Area	Type	Width	Ref#	ng/ul	Name
8.641	102914	BB	0.045	1	113.837	1-Chloro-Octane
19.707	138683	BB	0.035	1	107.332	o-Terphenyl

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Burlington Environmental, Date: March 23, 1993
Seattle Facility

Report On: Analysis of Water

Lab No.: 30645

Page 1 of 6

IDENTIFICATION:

Sample received on 03-09-93

P.O. No. 32189

Project: Pier 91

Client ID: 45323 (CP-122B-DW)

ANALYSIS:

Volatile Organics by Method 8240

Date Analyzed: 3-10-93

Compound	Concentration ug/l	PQL	Flag
Chloromethane	ND	10	
Bromomethane	ND	10	
Vinyl Chloride	ND	10	
Chloroethane	ND	10	
Methylene Chloride	2.7	5	B1, J
Acetone	ND	50	
Carbon Disulfide	ND	5	
1,1-Dichloroethene	ND	5	
1,1-Dichloroethane	ND	5	
1,2-Dichloroethene (Total)	ND	5	
Chloroform	ND	5	
1,2-Dichloroethane	ND	5	
2-Butanone	ND	25	
1,1,1-Trichloroethane	ND	5	
Carbon Tetrachloride	ND	5	
Vinyl Acetate	ND	25	
Bromodichloromethane	ND	5	
1,2-Dichloropropane	ND	5	
Cis-1,3-Dichloropropene	ND	5	
Trichloroethene	1.6	5	B1, J
Dibromochloromethane	ND	5	
1,1,2-Trichloroethane	ND	5	

ND - Not Detected

PQL - Practical Quantitation Limit

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Seattle Facility
 Project: Pier 91
 Page 2 of 6
 Lab No. 30645
 March 23, 1993

Client ID: 45323 (CP-122B-DW)

8240 Continued

Compound	Concentration ug/l	PQL	Flag
Benzene	ND	5	
Trans-1,3-Dichloropropene	ND	5	
Bromoform	ND	5	
4-Methyl-2-Pentanone	ND	25	
2-Hexanone	ND	5	
Tetrachloroethene	ND	5	
1,1,2,2-Tetrachloroethane	ND	5	
Toluene	ND	5	
Chlorobenzene	ND	5	
Ethyl Benzene	ND	5	
Styrene	ND	5	
Total Xylenes	ND	5	

ND - Not Detected
 PQL - Practical Quantitation Limit

Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits	
		Water	Soil
Toluene - D8	100	88 - 110	81 - 117
Bromofluorobenzene	97	86 - 115	74 - 121
1,2-Dichloroethane-D4	99	76 - 114	70 - 121

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Seattle Facility
 Project: Pier 91
 Page 3 of 6
 Lab No. 30645
 March 23, 1993

Client ID: 45323 (CP-122B-DW)

Semivolatile Organics Per EPA SW-846 Method 8270
 Date Extracted: 3-9-93
 Date Analyzed: 3-11-93

Compound	Concentration ug/l	PQL	Flag
Phenol	ND	9.4	
bis(2-Chloroethyl) ether	ND	9.4	
2-Chlorophenol	ND	9.4	
1,3-Dichlorobenzene	ND	9.4	
1,4-Dichlorobenzene	ND	9.4	
Benzyl Alcohol	ND	19	
1,2-Dichlorobenzene	ND	9.4	
2-Methylphenol	ND	9.4	
bis(2-Chloroisopropyl)ether	ND	9.4	
4-Methylphenol	ND	9.4	
N-Nitroso-Di-N-propylamine	ND	9.4	
Hexachloroethane	ND	9.4	
Nitrobenzene	ND	9.4	
Isophorone	ND	9.4	
2-Nitrophenol	ND	9.4	
2,4-Dimethylphenol	ND	9.4	
Benzoic Acid	ND	47	
bis(2-Chloroethoxy)methane	ND	9.4	
2,4-Dichlorophenol	ND	9.4	
1,2,4-Trichlorobenzene	ND	9.4	
Naphthalene	ND	9.4	
4-Chloroaniline	ND	19	
Hexachlorobutadiene	ND	9.4	
4-Chloro-3-methylphenol	ND	19	

ND - Not Detected
 PQL - Practical Quantitation Limit

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Seattle Facility
 Project: Pier 91
 Page 4 of 6
 Lab No. 30645
 March 23, 1993

Client ID: 45323 (CP-122B-DW)

EPA Method 8270 Continued

Compound	Concentration ug/l	PQL	Flag
2-Methylnaphthalene	ND	9.4	
Hexachlorocyclopentadiene	ND	9.4	
2,4,6-Trichlorophenol	ND	9.4	
2,4,5-Trichlorophenol	ND	9.4	
2-Chloronaphthalene	ND	9.4	
2-Nitroaniline	ND	47	
Dimethyl phthalate	ND	9.4	
Acenaphthylene	ND	9.4	
2,6-Dinitrotoluene	ND	9.4	
3-Nitroaniline	ND	47	
Acenaphthene	ND	9.4	
2,4-Dinitrophenol	ND	47	
4-Nitrophenol	ND	47	
Dibenzofuran	ND	9.4	
2,4-Dinitrotoluene	ND	9.4	
Diethylphthalate	ND	9.4	
4-Chlorophenyl phenyl ether	ND	9.4	
Fluorene	ND	9.4	
4-Nitroaniline	ND	47	
4,6-Dinitro-2-methylphenol	ND	47	
N-Nitrosodiphenylamine	ND	9.4	
4-Bromophenyl phenyl ether	ND	9.4	
Hexachlorobenzene	ND	9.4	
Pentachlorophenol	ND	47	
Phenanthrene	ND	9.4	
Anthracene	ND	9.4	
Di-n-butylphthalate	9.0	9.4	B, J

ND - Not Detected

PQL - Practical Quantitation Limit

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Seattle Facility
 Project: Pier 91
 Page 5 of 6
 Lab No. 30645
 March 23, 1993

Client ID: 45323 (CP-122B-DW)

EPA Method 8270 Continued

Compound	Concentration ug/l	PQL	Flag
Fluoranthene	ND	9.4	
Pyrene	ND	9.4	
Butyl benzyl phthalate	ND	9.4	
3,3'-Dichlorobenzidine	ND	19	
Benzo(a)anthracene	ND	9.4	
Chrysene	ND	9.4	
bis(2-ethylhexyl)phthalate	ND	9.4	
Di-n-octyl phthalate	ND	9.4	
Benzo(b)fluoranthene	ND	9.4	
Benzo(k)fluoranthene	ND	9.4	
Benzo(a)pyrene	ND	9.4	
Indeno(1,2,3-cd)pyrene	ND	9.4	
Dibenz(a,h)anthracene	ND	9.4	
Benzo(g,h,i)perylene	ND	9.4	

ND - Not Detected

PQL - Practical Quantitation Limit

Semi-Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits	
		Water	Soil
Nitrobenzene - d ₅	72	35 - 114	23 - 120
2-Fluorobiphenyl	72	43 - 116	30 - 115
p-Terphenyl-d ₁₄	82	33 - 141	18 - 137
Phenol-d ₆	24	10 - 94	24 - 113
2-Fluorophenol	42	21 - 100	25 - 121
2,4,6-Tribromophenol	76	10 - 123	19 - 122

Continued.

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Seattle Facility
Project: Pier 91
Page 6 of 6
Lab No. 30645
March 23, 1993

Client ID: 45323 (CP-122B-DW)

TPH Per EPA Method 418.1
Date Extracted: 3-10-93
Date Analyzed: 3-10-93

<u>Parameters</u>	<u>Concentration, mg/l</u>	<u>PQL</u>	<u>Flag</u>
Total Petroleum Hydrocarbons, mg/l	ND	1.0	

TPH Per EPA SW-846 Modified Method 8015
Date Extracted: 3-11-93
Date Analyzed: 3-11-93

<u>Parameters</u>	<u>Concentration, mg/l</u>	<u>PQL</u>	<u>Flag</u>
Total Petroleum Fuel Hydrocarbons, mg/l	ND	0.75	
<u>SURROGATE RECOVERY, %</u>			
1-chlorooctane	69		
o-terphenyl	102		

ND - Not Detected
PQL - Practical Quantitation Limit

SOUND ANALYTICAL SERVICES


DENNIS L. BEAN

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

Total Petroleum Hydrocarbons by Method 418.1

Client: Burlington Environmental, Seattle Facility
Lab No: 30645qc1
Units: mg/l
Date: March 23, 1993

BLANK SPIKE RECOVERY

Parameter	Spike Added	Spike Recovered	%R
TPH	100	77	77

%R = Percent Recovery
= $[(MS - SR) / SA] \times 100$

METHOD BLANK

Parameter	Result	PQL
TPH	ND	1.0

ND - Not Detected

PQL - Practical Quantitation Limit

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

QUALITY CONTROL REPORT

Total Petroleum Fuel Hydrocarbons by Method 8015

Client: Burlington Environmental, Seattle Facility
Lab No: 30645qc3
Matrix: Water
Units: mg/l
Date: March 23, 1993

BLANK SPIKE RECOVERY

BS No. 004F0101.D

Parameter	Spike Added	Spike Recovered	%R
Total Petroleum Fuel Hydrocarbons	402	511	127

BLANK SPIKE DUPLICATE RECOVERY

BSD No. 005F0101.D

Parameter	Spike Added	Spike Recovered	%R
Total Petroleum Fuel Hydrocarbons	402	475	118

%R = Percent Recovery
= $[(BS - SR) / SA] \times 100$

METHOD BLANK

Blank No. 003F0101.D

Parameter	Result	PQL
Total Petroleum Fuel Hydrocarbons	ND	0.75
<u>SURROGATE RECOVERY%</u> 1-chlorooctane	111	
o-terphenyl	117	

ND - Not Detected
PQL - Practical Quantitation Limit

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

VOLATILE ORGANICS PER EPA METHOD 8240

Page 1 of 2

Client: Burlington Environmental, Seattle Facility
Lab No: 30645qc4
Units: ug/l
Date: March 23, 1993
Blank No: V9009

METHOD BLANK

Compound	Result	PQL	FLAGS
Chloromethane	ND	10	
Bromomethane	ND	10	
Vinyl Chloride	ND	10	
Chloroethane	ND	10	
Methylene Chloride	3.4	5	J
Acetone	ND	50	
Carbon Disulfide	ND	5	
1,1-Dichloroethene	ND	5	
1,1-Dichloroethane	ND	5	
1,2-Dichloroethene (Total)	ND	5	
Chloroform	ND	5	
1,2-Dichloroethane	ND	5	
2-Butanone	ND	25	
1,1,1-Trichloroethane	ND	5	
Carbon Tetrachloride	ND	5	
Vinyl Acetate	ND	25	
Bromodichloromethane	ND	5	
1,2-Dichloropropane	ND	5	
Cis-1,3-Dichloropropene	ND	5	
Trichloroethene	1.8	5	J
Dibromochloromethane	ND	5	
1,1,2-Trichloroethane	ND	5	
Benzene	ND	5	
Trans-1,3-Dichloropropene	ND	5	
Bromoform	ND	5	
4-Methyl-2-Pentanone	ND	25	
2-Hexanone	ND	5	
Tetrachloroethene	ND	5	
1,1,2,2-Tetrachloroethane	ND	5	
Toluene	ND	5	
Chlorobenzene	ND	5	
Ethyl Benzene	ND	5	
Styrene	ND	5	
Total Xylenes	ND	5	

PQL - Practical Quantitation Limit

ND - Not Detected

SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

VOLATILE ORGANICS PER EPA METHOD 8240

Page 2 of 2

Client: Burlington Environmental, Seattle Facility
Lab No: 30645qc4
Date: March 23, 1993
Blank No: V9009

METHOD BLANK

VOLATILE SURROGATES

Surrogate	Percent Recovery	Control Limits	
		Water	Soil
Toluene - d8	100	86 - 115	81 - 117
Bromofluorobenzene	96	76 - 114	74 - 121
1,2-Dichloroethane d4	95	88 - 110	70 - 121

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

QUALITY CONTROL REPORT

VOLATILE ORGANICS - METHOD 8240

Client: Burlington Environmental, Seattle Facility
Lab No: 30645qc5
Units: ug/L
Date: March 23, 1993

BLANK SPIKE RECOVERY

Compound	Spike Added (SA)	Spike Result (SR)	%R	(Dup) Spike Added (DSA)	(Dup) Spike Result (DSR)	%R	RPD
1,1-DCE	50	43	86	50	44	88	2.3
TCE	50	45	90	50	44	88	2.2
Chlorobenzene	50	51	102	50	51	102	0
Chloroform	50	50	100	50	50	100	0
Tetrachloro-ethene	50	46	92	50	47	94	2.2

% R = Percent Recovery
= $[(SR - SA) / SA] \times 100$

RPD = Relative Percent Difference
= $[(S\%R - DS\%R) / ((S\%R + DS\%R) / 2)] \times 100$

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

SEMIVOLATILE ORGANICS PER EPA METHOD 8270

Page 1 of 3

Client: Burlington Environmental, Seattle Facility
Lab No: 30645qc6
Units: ug/l
Date: March 23, 1993
Blank No: SBLK68-S8145

METHOD BLANK

Compound	Result	PQL	Flags
Phenol	ND	10	
bis(2-Chloroethyl) ether	ND	10	
2-Chlorophenol	ND	10	
1,3-Dichlorobenzene	ND	10	
1,4-Dichlorobenzene	ND	10	
Benzyl Alcohol	ND	20	
1,2-Dichlorobenzene	ND	10	
2-Methylphenol	ND	10	
bis(2-Chloroisopropyl) ether	ND	10	
4-Methylphenol	ND	10	
N-Nitroso-Di-N-propylamine	ND	10	
Hexachloroethane	ND	10	
Nitrobenzene	ND	10	
Isophorone	ND	10	
2-Nitrophenol	ND	10	
2,4-Dimethylphenol	ND	10	
Benzoic Acid	ND	50	
bis(2-Chloroethoxy)methane	ND	10	
2,4-Dichlorophenol	ND	10	
1,2,4-Trichlorobenzene	ND	10	
Naphthalene	ND	10	
4-Chloroaniline	ND	20	
Hexachlorobutadiene	ND	10	
4-Chloro-3-methylphenol	ND	20	
2-Methylnaphthalene	ND	10	
Hexachlorocyclopentadiene	ND	10	
2,4,6-Trichlorophenol	ND	10	
2,4,5-Trichlorophenol	ND	10	
2-Chloronaphthalene	ND	10	
2-Nitroaniline	ND	50	
Dimethyl phthalate	ND	10	
Acenaphthylene	ND	10	

PQL - Practical Quantitation Limit

ND - Not Detected

SOUND ANALYTICAL SERVICES, INC.

SEMIVOLATILE ORGANICS PER EPA METHOD 8270

Page 2 of 3

Client: Burlington Environmental, Seattle Facility
 Lab No: 30645qc6
 Units: ug/l
 Date: March 23, 1993
 Blank No: SBLK68-S8145

METHOD BLANK

Compound	Result	PQL	Flags
3-Nitroaniline	ND	50	
Acenaphthene	ND	10	
2,4-Dinitrophenol	ND	50	
4-Nitrophenol	ND	50	
Dibenzofuran	ND	10	
2,4-Dinitrotoluene	ND	10	
2,6-Dinitrotoluene	ND	10	
Diethylphthalate	ND	10	
4-Chlorophenyl phenyl ether	ND	10	
Fluorene	ND	10	
4-Nitroaniline	ND	50	
4,6-Dinitro-2-methylphenol	ND	50	
N-Nitrosodiphenylamine	ND	10	
4-Bromophenyl phenyl ether	ND	10	
Hexachlorobenzene	ND	10	
Pentachlorophenol	ND	50	
Phenanthrene	ND	10	
Anthracene	ND	10	
Di-n-butylphthalate	5.6	10	J
Fluoranthene	ND	10	
Pyrene	ND	10	
Butyl benzyl phthalate	ND	10	
3,3'-Dichlorobenzidine	ND	20	
Benzo(a)anthracene	ND	10	
bis(2-ethylhexyl)phthalate	ND	10	
Chrysene	ND	10	
Di-n-octyl phthalate	ND	10	
Benzo(b)fluoranthene	ND	10	
Benzo(k)fluoranthene	ND	10	
Benzo(a)pyrene	ND	10	
Indeno(1,2,3-cd)pyrene	ND	10	
Dibenz(a,h)anthracene	ND	10	
Benzo(g,h,i)perylene	ND	10	

PQL - Practical Quantitation Limit
 ND - Not Detected

SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

SEMIVOLATILE ORGANICS PER EPA METHOD 8270

Page 3 of 3

Client: Burlington Environmental, Seattle Facility
Lab No: 30645qc6
Date: March 23, 1993
Blank No: SBLK68-S8145

METHOD BLANK

SEMIVOLATILE SURROGATES

Surrogate	Percent Recovery	Control Limits	
		Water	Soil
Nitrobenzene - d5	79	35 - 114	23 - 120
2-Fluorobiphenyl	68	43 - 116	30 - 115
p-Terphenyl-d14	76	33 - 141	18 - 137
Phenol-d6	29	10 - 94	24 - 113
2-Fluorophenol	48	21 - 100	25 - 121
2,4,6-TBP	77	10 - 123	19 - 122

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

WATER MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

Client Name: Burlington Environmental, Seattle Facility
 Lab No: 30645qc7
 Date: March 23, 1993

SEMI-VOLATILE ORGANICS

COMPOUND	SPIKE (ug/l)	SAMPLE RESULT	CONC MS	% REC	CONC MSD	% REC	RPD	FLAGS
Phenol	100	ND	25	25	28	28	11	
2-Chlorophenol	100	ND	59	59	61	61	3.3	
1,4-Dichlorobenzene	100	ND	87	87	ND	*	*	
N-nitrosodi-n-Propylamine	100	ND	144	144	ND	*	*	
1,2,4-Trichlorobenzene	100	ND	96	96	ND	*	*	
4-Chloro-3-Methylphenol	100	ND	58	58	62	62	6.7	
Acenaphthene	100	ND	103	103	ND	*	*	
4-Nitrophenol	100	ND	16	16	16	16	0	
2,4 Dinitrotoluene	100	ND	114	114	ND	*	*	
Pentachlorophenol	100	ND	51	51	55	55	7.6	
Pyrene	100	ND	123	123	ND	*	*	

RPD = Relative Percent Difference

% REC = Percent Recovery

ND - Not Detected

*Base Neutral Spike for Matrix Spike Duplicate was inadvertently added to Matr Spike

ADVISORY LIMITS:

	<u>RPD</u>	<u>% RECOVERY</u>
Phenol	42	12 - 89
2-Chlorophenol	40	27 - 123
1,4-Dichlorobenzene	28	36 - 97
N-nitrosodi-n-Propylamine	38	41 - 116
1,2,4-Trichlorobenzene	28	39 - 98
4-Chloro-3-Methylphenol	42	23 - 97
Acenaphthene	31	46 - 118
4-Nitrophenol	50	10 - 80
2,4 Dinitrotoluene	38	24 - 96
Pentachlorophenol	50	9 - 103
Pyrene	31	26 - 127

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

DATA QUALIFIER FLAGS

- ND: Indicates that the analyte was analyzed for but was not detected. The associated numerical value is the practical quantitation limit, corrected for sample dilution.
- J: The analyte was analyzed for and positively identified, but the associated numerical value is an estimated quantity.
- C: The identification of this analyte was confirmed by GC/MS.
- B1: This analyte was also detected in the associated method blank. The reported sample results have been adjusted for moisture, final extract volume, and/or dilutions performed during extract preparation. The analyte concentration was evaluated prior to sample preparation adjustments, and was determined not to be significantly higher than the associated method blank (less than ten times the concentration reported in the blank).
- B2: This analyte was also detected in the associated method blank. However, the analyte concentration in the sample was determined to be significantly higher than the method blank (greater than ten times the concentration reported in the blank).
- E: The concentration of this analyte exceeded the instrument calibration range.
- D: The reported result for this analyte is calculated based on a secondary dilution factor.
- A: This TIC is a suspected aldol-condensation product.
- M: Quantitation Limits are elevated due to matrix interferences.
- S: The calibration quality control criteria for this compound were not met. The reported concentration should be considered an estimated quantity.
- X1: Contaminant does not appear to be "typical" product. Elution pattern suggests it may be _____.
- X2: Contaminant does not appear to be "typical" product. Further testing is suggested for identification.
- X3: Identification and quantification of peaks was complicated by matrix interference; GC/MS confirmation is recommended.
- X4: RPD for duplicates outside QC limits. Sample was re-analyzed with similar results. Sample matrix is nonhomogeneous.
- X4a: RPD for duplicates outside QC limits due to analyte concentration near the method practical quantitation limit/detection limit.
- X5: Matrix spike was diluted out during analysis.
- X6: Recovery of matrix spike outside QC limits. Sample was re-analyzed with similar results.
- X7: Recovery of matrix spike outside QC limits. Matrix interference is indicated by blank spike recovery data.
- X7a: RPD value for MS/MSD outside QC limits due to high contaminant levels.
- X8: Surrogate was diluted out during analysis.
- X9: Surrogate recovery outside QC limits due to matrix composition.
- X10: Surrogate recovery outside QC limits due to high contaminant levels.

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

March 4, 1993

TO: Burlington Environmental Engineering

PROJECT NUMBER: 624878-7304

PROJECT NAME: Pier 91

LABORATORY WORK ORDER NUMBER: 29663

Samples were taken on 1/18/93 and were received at Sound on 1/19/93. Samples were analyzed for Volatile Organics in accordance with EPA SW-846 Method 8240, Semivolatile Organics in accordance with EPA SW-846 Method 8270, Total Petroleum Hydrocarbons by EPA Method 418.1 modified for soil, and Total Petroleum Fuel Hydrocarbons by EPA Method 8015 modified.

VOLATILE ORGANICS

Samples 29663-1 and 29663-2 were extracted on 1/20/93 and analyzed on 1/21/93. Methylene chloride was detected in the method blank at a level above the PQL. Sample results for methylene chloride were flagged B to indicate this. The percent recovery for 1,1-dichloroethene in the MS/MSD analysis exceeded QC limits. All other QC parameters were within acceptance limits.

SEMIVOLATILE ORGANICS

Samples 29663-1 and 29663-2 were extracted on 1/20/93 and analyzed on 1/21/93. Sample 29663-1 was diluted due to high TPH concentration. Percent recoveries for the surrogates in sample 29663-1 were not calculated due to the necessary dilution. Di-n-butylphthalate was detected in the method blank at a level above the PQL. Sample results for Di-n-butylphthalate were flagged B to indicate this. The relative percent difference value for bis(2-ethylhexyl)phthalate in the duplicate analysis exceeded QC limits, but the compound was present at concentrations below the PQL. All other QC parameters were within acceptance limits.

TOTAL PETROLEUM FUEL HYDROCARBONS

Samples 29663-1 and 29663-2 were extracted and analyzed on 1/22/93. No contamination above the PQL was present in the method blank. The percent recoveries for the surrogates in both samples were outside QC limits due to high contaminant levels. Both samples were flagged X2 to note the presence of compounds that fall across multiple product ranges. MS/MSD results were not calculated due to high contaminant levels. All other QC parameters were within acceptance limits.

SOUND ANALYTICAL SERVICES, INC.

TOTAL PETROLEUM HYDROCARBONS

Samples 29663-1 and 29663-2 were extracted and analyzed on 1/22/93. No contamination above the PQL was present in the method blank. The percent recoveries on the MS/MSD analyses were outside QC limits due to high contaminant levels. The relative percent difference value for the duplicate analysis exceeded QC limits due to a nonhomogenous sample matrix. All other QC parameters were within acceptance limits.

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Technical
 Project: 624878-7302 Pier 91
 Page 2 of 12
 Lab No. 29663
 February 5, 1993

Lab No. 29663-1

Client ID: CP-122B-2-4

8240 Continued . . .

Compound	Concentration ug/kg	PQL	Flag
Benzene	ND	250	
Trans-1,3-Dichloropropene	ND	250	
Bromoform	ND	250	
4-Methyl-2-Pentanone	ND	1,250	
2-Hexanone	ND	250	
Tetrachloroethene	ND	250	
1,1,2,2-Tetrachloroethane	ND	250	
Toluene	57	250	B, J
Chlorobenzene	ND	250	
Ethyl Benzene	ND	250	
Styrene	ND	250	
Total Xylenes	ND	250	

ND - Not Detected

PQL - Practical Quantitation Limit

Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits	
		Water	Soil
Toluene - D8	105	88 - 110	81 - 117
Bromofluorobenzene	90	86 - 115	74 - 121
1,2-Dichloroethane-D4	89	76 - 114	70 - 121

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Technical
 Project: 624878-7302 Pier 91
 Page 3 of 12
 Lab No. 29663
 February 5, 1993

Lab No. 29663-1

Client ID: CP-122B-2-4

Semivolatile Organics Per EPA SW-846 Method 8270

Date Extracted: 1-20-93

Date Analyzed: 1-21-93

Compound	Concentration ug/kg	PQL	Flag
Phenol	ND	16,000	
bis(2-Chloroethyl) ether	ND	16,000	
2-Chlorophenol	ND	16,000	
1,3-Dichlorobenzene	ND	16,000	
1,4-Dichlorobenzene	ND	16,000	
Benzyl Alcohol	ND	32,000	
1,2-Dichlorobenzene	ND	16,000	
2-Methylphenol	ND	16,000	
bis(2-Chloroisopropyl) ether	ND	16,000	
4-Methylphenol	ND	16,000	
N-Nitroso-Di-N-propylamine	ND	16,000	
Hexachloroethane	ND	16,000	
Nitrobenzene	ND	16,000	
Isophorone	ND	16,000	
2-Nitrophenol	ND	16,000	
2,4-Dimethylphenol	ND	16,000	
Benzoic Acid	ND	79,000	
bis(2-Chloroethoxy)methane	ND	16,000	
2,4-Dichlorophenol	ND	16,000	
1,2,4-Trichlorobenzene	ND	16,000	
Naphthalene	ND	16,000	
4-Chloroaniline	ND	32,000	
Hexachlorobutadiene	ND	16,000	
4-Chloro-3-methylphenol	ND	32,000	

ND - Not Detected

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Technical
 Project: 624878-7302 Pier 91
 Page 4 of 12
 Lab No. 29663
 February 5, 1993

Lab No. 29663-1

Client ID: CP-122B-2-4

EPA Method 8270 Continued

Compound	Concentration ug/kg	PQL	Flag
2-Methylnaphthalene	ND	16,000	
Hexachlorocyclopentadiene	ND	16,000	
2,4,6-Trichlorophenol	ND	16,000	
2,4,5-Trichlorophenol	ND	16,000	
2-Chloronaphthalene	ND	16,000	
2-Nitroaniline	ND	79,000	
Dimethyl phthalate	ND	16,000	
Acenaphthylene	ND	16,000	
2,6-Dinitrotoluene	ND	16,000	
3-Nitroaniline	ND	79,000	
Acenaphthene	ND	16,000	
2,4-Dinitrophenol	ND	79,000	
4-Nitrophenol	ND	79,000	
Dibenzofuran	ND	16,000	
2,4-Dinitrotoluene	ND	16,000	
Diethylphthalate	ND	16,000	
4-Chlorophenyl phenyl ether	ND	16,000	
Fluorene	ND	16,000	
4-Nitroaniline	ND	79,000	
4,6-Dinitro-2-methylphenol	ND	79,000	
N-Nitrosodiphenylamine	ND	16,000	
4-Bromophenyl phenyl ether	ND	16,000	
Hexachlorobenzene	ND	16,000	
Pentachlorophenol	ND	79,000	
Phenanthrene	ND	16,000	
Anthracene	ND	16,000	
Di-n-butylphthalate	4,100	16,000	B, J

ND - Not Detected

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Technical
 Project: 624878-7302 Pier 91
 Page 5 of 12
 Lab No. 29663
 February 5, 1993

Lab No. 29663-1

Client ID: CP-122B-2-4

EPA Method 8270 Continued

Compound	Concentration ug/kg	PQL	Flag
Fluoranthene	ND	16,000	
Pyrene	ND	16,000	
Butyl benzyl phthalate	ND	16,000	
3,3'-Dichlorobenzidine	ND	32,000	
Benzo(a)anthracene	ND	16,000	
Chrysene	ND	16,000	
bis(2-ethylhexyl)phthalate	ND	16,000	
Di-n-octyl phthalate	ND	16,000	
Benzo(b)fluoranthene	ND	16,000	
Benzo(k)fluoranthene	ND	16,000	
Benzo(a)pyrene	ND	16,000	
Indeno(1,2,3-cd)pyrene	ND	16,000	
Dibenz(a,h)anthracene	ND	16,000	
Benzo(g,h,i)perylene	ND	16,000	

ND - Not Detected

PQL - Practical Quantitation Limit

Semi-Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits	
		Water	Soil
Nitrobenzene - d ₅	X8	35 - 114	23 - 120
2-Fluorobiphenyl	X8	43 - 116	30 - 115
p-Terphenyl-d ₁₄	X8	33 - 141	18 - 137
Phenol-d ₆	X8	10 - 94	24 - 113
2-Fluorophenol	X8	21 - 100	25 - 121
2,4,6-Tribromophenol	X8	10 - 123	19 - 122

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Technical
Project: 624878-7302 Pier 91
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Lab No. 29663
February 5, 1993

Lab No. 29663-1

Client ID: CP-122B-2-4

TPH Per EPA Method 418.1
Date Extracted: 1-22-93
Date Analyzed: 1-22-93

Total Petroleum
Hydrocarbons, mg/kg 5,900

TPH Per EPA SW-846 Modified Method 8015
Date Extracted: 1-22-93
Date Analyzed: 1-22-93

Total Petroleum
Fuel Hydrocarbons, mg/kg 14,000 X2

TPH as Aged Gasoline, Diesel

SURROGATE RECOVERY, %

1-chlorooctane	132	
o-terphenyl	382	X10

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Technical
 Project: 624878-7302 Pier 91
 Page 7 of 12
 Lab No. 29663
 February 5, 1993

Lab No. 29663-2

Client ID: CP-122B-6-8

Volatile Organics by Method 8240

Date Extracted: 1-20-93

Date Analyzed: 1-21-93

Compound	Concentration ug/kg	PQL	Flag
Chloromethane	ND	500	
Bromomethane	ND	500	
Vinyl Chloride	ND	500	
Chloroethane	ND	500	
Methylene Chloride	170	250	B, J
Acetone	150	2,500	J
Carbon Disulfide	ND	250	
1,1-Dichloroethene	ND	250	
1,1-Dichloroethane	ND	250	
1,2-Dichloroethene (Total)	ND	250	
Chloroform	ND	250	
1,2-Dichloroethane	ND	250	
2-Butanone	ND	1,250	
1,1,1-Trichloroethane	ND	250	
Carbon Tetrachloride	ND	250	
Vinyl Acetate	ND	1,250	
Bromodichloromethane	ND	250	
1,2-Dichloropropane	ND	250	
Cis-1,3-Dichloropropene	ND	250	
Trichloroethene	ND	250	
Dibromochloromethane	ND	250	
1,1,2-Trichloroethane	ND	250	

ND = Not Detected

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Technical
 Project: 624878-7302 Pier 91
 Page 8 of 12
 Lab No. 29663
 February 5, 1993

Lab No. 29663-2

Client ID: CP-122B-6-8

8240 Continued . . .

Compound	Concentration ug/kg	PQL	Flag
Benzene	ND	250	
Trans-1,3-Dichloropropene	ND	250	
Bromoform	ND	250	
4-Methyl-2-Pentanone	ND	1,250	
2-Hexanone	ND	250	
Tetrachloroethene	ND	250	
1,1,2,2-Tetrachloroethane	ND	250	
Toluene	ND	250	
Chlorobenzene	ND	250	
Ethyl Benzene	ND	250	
Styrene	ND	250	
Total Xylenes	ND	250	

ND - Not Detected

PQL - Practical Quantitation Limit

Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits	
		Water	Soil
Toluene - D8	100	88 - 110	81 - 117
Bromofluorobenzene	91	86 - 115	74 - 121
1,2-Dichloroethane-D4	88	76 - 114	70 - 121

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Technical
 Project: 624878-7302 Pier 91
 Page 9 of 12
 Lab No. 29663
 February 5, 1993

Lab No. 29663-2

Client ID: CP-122B-6-8

Semivolatile Organics Per EPA SW-846 Method 8270

Date Extracted: 1-20-93

Date Analyzed: 1-21-93

Compound	Concentration ug/kg	PQL	Flag
Phenol	ND	1,600	
bis(2-Chloroethyl) ether	ND	1,600	
2-Chlorophenol	ND	1,600	
1,3-Dichlorobenzene	ND	1,600	
1,4-Dichlorobenzene	ND	1,600	
Benzyl Alcohol	ND	3,200	
1,2-Dichlorobenzene	ND	1,600	
2-Methylphenol	ND	1,600	
bis(2-Chloroisopropyl) ether	ND	1,600	
4-Methylphenol	ND	1,600	
N-Nitroso-Di-N-propylamine	ND	1,600	
Hexachloroethane	ND	1,600	
Nitrobenzene	ND	1,600	
Isophorone	ND	1,600	
2-Nitrophenol	ND	1,600	
2,4-Dimethylphenol	ND	1,600	
Benzoic Acid	ND	7,900	
bis(2-Chloroethoxy) methane	ND	1,600	
2,4-Dichlorophenol	ND	1,600	
1,2,4-Trichlorobenzene	ND	1,600	
Naphthalene	ND	1,600	
4-Chloroaniline	ND	3,200	
Hexachlorobutadiene	ND	1,600	
4-Chloro-3-methylphenol	ND	3,200	

ND - Not Detected

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Technical
 Project: 624878-7302 Pier 91
 Page 10 of 12
 Lab No. 29663
 February 5, 1993

Lab No. 29663-2

Client ID: CP-122B-6-8

EPA Method 8270 Continued

Compound	Concentration ug/kg	PQL	Flag
2-Methylnaphthalene	ND	1,600	
Hexachlorocyclopentadiene	ND	1,600	
2,4,6-Trichlorophenol	ND	1,600	
2,4,5-Trichlorophenol	ND	1,600	
2-Chloronaphthalene	ND	1,600	
2-Nitroaniline	ND	7,900	
Dimethyl phthalate	ND	1,600	
Acenaphthylene	ND	1,600	
2,6-Dinitrotoluene	ND	1,600	
3-Nitroaniline	ND	7,900	
Acenaphthene	ND	1,600	
2,4-Dinitrophenol	ND	7,900	
4-Nitrophenol	ND	7,900	
Dibenzofuran	ND	1,600	
2,4-Dinitrotoluene	ND	1,600	
Diethylphthalate	ND	1,600	
4-Chlorophenyl phenyl ether	ND	1,600	
Fluorene	ND	1,600	
4-Nitroaniline	ND	7,900	
4,6-Dinitro-2-methylphenol	ND	7,900	
N-Nitrosodiphenylamine	ND	1,600	
4-Bromophenyl phenyl ether	ND	1,600	
Hexachlorobenzene	ND	1,600	
Pentachlorophenol	ND	7,900	
Phenanthrene	ND	1,600	
Anthracene	ND	1,600	
Di-n-butylphthalate	4,000	1,600	B

ND - Not Detected

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Technical
 Project: 624878-7302 Pier 91
 Page 11 of 12
 Lab No. 29663
 February 5, 1993

Lab No. 29663-2

Client ID: CP-122B-6-8

EPA Method 8270 Continued

Compound	Concentration ug/kg	PQL	Flag
Fluoranthene	ND	1,600	B, J
Pyrene	ND	1,600	
Butyl benzyl phthalate	ND	1,600	
3,3'-Dichlorobenzidine	ND	3,200	
Benzo(a)anthracene	ND	1,600	
Chrysene	ND	1,600	
bis(2-ethylhexyl)phthalate	230	1,600	
Di-n-octyl phthalate	ND	1,600	
Benzo(b)fluoranthene	ND	1,600	
Benzo(k)fluoranthene	ND	1,600	
Benzo(a)pyrene	ND	1,600	
Indeno(1,2,3-cd)pyrene	ND	1,600	
Dibenz(a,h)anthracene	ND	1,600	
Benzo(g,h,i)perylene	ND	1,600	

ND - Not Detected

PQL - Practical Quantitation Limit

Semi-Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits	
		Water	Soil
Nitrobenzene - d ₅	54	35 - 114	23 - 120
2-Fluorobiphenyl	79	43 - 116	30 - 115
p-Terphenyl-d ₁₄	89	33 - 141	18 - 137
Phenol-d ₆	58	10 - 94	24 - 113
2-Fluorophenol	52	21 - 100	25 - 121
2,4,6-Tribromophenol	82	10 - 123	19 - 122

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Technical
Project: 624878-7302 Pier 91
Page 12 of 12
Lab No. 29663
February 5, 1993

Lab No. 29663-2

Client ID: CP-122B-6-8

TPH Per EPA Method 418.1
Date Extracted: 1-22-93
Date Analyzed: 1-22-93

Total Petroleum
Hydrocarbons, mg/kg 8,200

TPH Per EPA SW-846 Modified Method 8015
Date Extracted: 1-22-93
Date Analyzed: 1-22-93

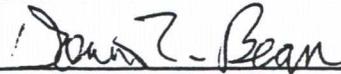
Total Petroleum
Fuel Hydrocarbons, mg/kg 5,200 X2

TPH as Aged Gasoline, Diesel

SURROGATE RECOVERY, %

1-chlorooctane X8
o-terphenyl X8

SOUND ANALYTICAL SERVICES


DENNIS L. BEAN

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

QUALITY CONTROL REPORT

TPH by Method 418.1

Client: Burlington Environmental, Technical
Lab No: 29663qcl
Matrix: soil
Units: mg/kg
Date: February 5, 1993

DUPLICATE

Dup No. 29720-21 Batch QC

Parameter	Sample(S)	Duplicate(D)	RPD
Total Petroleum Hydrocarbons	43,000	45,700	6.1

RPD = Relative Percent Difference
= $[(S - D) / ((S + D) / 2)] \times 100$

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 29720-21 Batch QC

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Total Petroleum Hydrocarbons	43,000	47,900	1380	X5	53,200	---

%R = Percent Recovery
= $[(MS - SR) / SA] \times 100$

RPD = Relative Percent Difference
= $[(MS - MSD) / ((MS + MSD) / 2)] \times 100$

METHOD BLANK

Parameter	Blank Value
Total Petroleum Hydrocarbons	< 10

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

QUALITY CONTROL REPORT

Total Petroleum Fuel Hydrocarbons
by Method 8015

Page 1 of 2

Client: Burlington Environmental, Technical
Lab No: 29663qc2
Matrix: Soil
Units: mg/kg
Date: February 5, 1993

DUPLICATE

Dup. No. 29663-1

Parameter	Sample(S)	Duplicate(D)	RPD
Total Petroleum Fuel Hydrocarbons	14,000	13,000	7.4
<u>SURROGATE RECOVERY%</u>			
1-chlorooctane			X8
o-terphenyl			X8

RPD = relative percent difference
= $[(S - D) / ((S + D) / 2)] \times 100$

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 29663-1

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Flag
Total Petroleum Fuel Hydrocarbons	14,000	12,000	402	---	X5

%R = Percent Recovery
= $[(MS - SR) / SA] \times 100$

SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

Total Petroleum Fuel Hydrocarbons
by Method 8015

Page 2 of 2

Client: Burlington Environmental, Technical
Lab No: 29663qc2
Matrix: Soil
Units: mg/kg
Date: February 5, 1993

BLANK SPIKE RECOVERY

BS No. 004F0101.D

Parameter	Spike Added	Spike Recovered	%R
Diesel	402	350	87

%R = Percent Recovery
= $[(MS - SR) / SA] \times 100$

METHOD BLANK

Blank No. 003F0101.D

Parameter	Blank Value
Total Petroleum Fuel Hydrocarbons	< 10
<u>SURROGATE RECOVERY%</u>	
1-chlorooctane	84
o-terphenyl	87

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

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QUALITY CONTROL REPORT

VOLATILE ORGANICS PER EPA METHOD 8240

Page 1 of 2

Client: Burlington Environmental, Technical
 Lab No: 29663qc3
 Units: ug/kg
 Date: February 5, 1993
 Blank No: V8024

METHOD BLANK

Compound	Blank Value	PQL	FLAGS
Chloromethane	ND	400	
Bromomethane	ND	400	
Vinyl Chloride	ND	400	
Chloroethane	ND	400	
Methylene Chloride	220	200	
Acetone	ND	2,000	
Carbon Disulfide	ND	200	
1,1-Dichloroethene	ND	200	
1,1-Dichloroethane	ND	200	
1,2-Dichloroethene (Total)	ND	200	
Chloroform	ND	200	
1,2-Dichloroethane	ND	200	
2-Butanone	ND	1,000	
1,1,1-Trichloroethane	ND	200	
Carbon Tetrachloride	ND	200	
Vinyl Acetate	ND	1,000	
Bromodichloromethane	ND	200	
1,2-Dichloropropane	ND	200	
Cis-1,3-Dichloropropene	ND	200	
Trichloroethene	ND	200	
Dibromochloromethane	ND	200	
1,1,2-Trichloroethane	ND	200	
Benzene	ND	200	
Trans-1,3-Dichloropropene	ND	200	
Bromoform	ND	200	
4-Methyl-2-Pentanone	ND	1,000	
2-Hexanone	ND	200	
Tetrachloroethene	ND	200	
1,1,2,2-Tetrachloroethane	ND	200	
Toluene	31	200	J
Chlorobenzene	ND	200	
Ethyl Benzene	ND	200	
Styrene	ND	200	
Total Xylenes	ND	200	

Continued

SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

VOLATILE ORGANICS PER EPA METHOD 8240

Page 2 of 2

Client: Burlington Environmental, Technical
Lab No: 29663qc3
Units: ug/kg
Date: February 5, 1993
Blank No: V8024

METHOD BLANK

ND - Not Detected

PQL - Practical Quantitation Limit

VOLATILE SURROGATES

Surrogate	Percent Recovery	Control Limits	
		Water	Soil
Toluene - d8	100	86 - 115	81 - 117
Bromofluorobenzene	105	76 - 114	74 - 121
1,2-Dichloroethane d4	90	88 - 110	70 - 121

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

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QUALITY CONTROL REPORT

SEMIVOLATILE ORGANICS PER EPA METHOD 8270

Page 1 of 3

Client: Burlington Environmental Technical
Lab No: 29663qc4
Units: ug/kg
Date: February 5, 1993
Blank No: S7420

METHOD BLANK

Compound	Blank Value	PQL	Flags
Phenol	ND	670	
bis(2-Chloroethyl) ether	ND	670	
2-Chlorophenol	ND	670	
1,3-Dichlorobenzene	ND	670	
1,4-Dichlorobenzene	ND	670	
Benzyl Alcohol	ND	1,300	
1,2-Dichlorobenzene	ND	670	
2-Methylphenol	ND	670	
bis(2-Chloroisopropyl) ether	ND	670	
4-Methylphenol	ND	670	
N-Nitroso-Di-N-propylamine	ND	670	
Hexachloroethane	ND	670	
Nitrobenzene	ND	670	
Isophorone	ND	670	
2-Nitrophenol	ND	670	
2,4-Dimethylphenol	ND	670	
Benzoic Acid	ND	3,300	
bis(2-Chloroethoxy)methane	ND	670	
2,4-Dichlorophenol	ND	670	
1,2,4-Trichlorobenzene	ND	670	
Naphthalene	ND	670	
4-Chloroaniline	ND	1,300	
Hexachlorobutadiene	ND	670	
4-Chloro-3-methylphenol	ND	1,300	
2-Methylnaphthalene	ND	670	
Hexachlorocyclopentadiene	ND	670	
2,4,6-Trichlorophenol	ND	670	
2,4,5-Trichlorophenol	ND	670	
2-Chloronaphthalene	ND	670	
2-Nitroaniline	ND	3,300	
Dimethyl phthalate	ND	670	
Acenaphthylene	ND	670	

Continued

SOUND ANALYTICAL SERVICES, INC.

SEMIVOLATILE ORGANICS PER EPA METHOD 8270

Page 2 of 3

Client: Burlington Environmental Technical
 Lab No: 29663qc4
 Units: ug/kg
 Date: February 5, 1993
 Blank No: S7420

METHOD BLANK

Compound	Blank Value	PQL	Flags
3-Nitroaniline	ND	3,300	
Acenaphthene	ND	670	
2,4-Dinitrophenol	ND	3,300	
4-Nitrophenol	ND	3,300	
Dibenzofuran	ND	670	
2,4-Dinitrotoluene	ND	670	
2,6-Dinitrotoluene	ND	670	
Diethylphthalate	ND	670	
4-Chlorophenyl phenyl ether	ND	670	
Fluorene	ND	670	
4-Nitroaniline	ND	3,300	
4,6-Dinitro-2-methylphenol	ND	3,300	
N-Nitrosodiphenylamine	ND	670	
4-Bromophenyl phenyl ether	ND	670	
Hexachlorobenzene	ND	670	
Pentachlorophenol	ND	3,300	
Phenanthrene	ND	670	
Anthracene	ND	670	
Di-n-butylphthalate	1,000	670	
Fluoranthene	ND	670	
Pyrene	ND	670	
Butyl benzyl phthalate	ND	670	
3,3'-Dichlorobenzidine	ND	1,300	
Benzo(a)anthracene	ND	670	
bis(2-ethylhexyl)phthalate	590	670	J
Chrysene	ND	670	
Di-n-octyl phthalate	ND	670	
Benzo(b)fluoranthene	ND	670	
Benzo(k)fluoranthene	ND	670	
Benzo(a)pyrene	ND	670	
Indeno(1,2,3-cd)pyrene	ND	670	
Dibenz(a,h)anthracene	ND	670	
Benzo(g,h,i)perylene	ND	670	

Continued. . . .

SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

SEMIVOLATILE ORGANICS PER EPA METHOD 8270

Page 3 of 3

Client: Burlington Environmental Technical
Lab No: 29663qc4
Date: February 5, 1993
Blank No: S7420

ND - Not Detected.

PQL - Practical Quantitation Limit

SEMIVOLATILE SURROGATES

Surrogate	Percent Recovery	Control Limits	
		Water	Soil
Nitrobenzene - d5	87	35 - 114	23 - 120
2-Fluorobiphenyl	79	43 - 116	30 - 115
p-Terphenyl-d14	89	33 - 141	18 - 137
Phenol-d6	85	10 - 94	24 - 113
2-Fluorophenol	81	21 - 100	25 - 121
2,4,6-TBP	85	10 - 123	19 - 122

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

SEMIVOLATILE ORGANICS PER EPA SW-846 METHOD 8270

Page 1 of 3

Client: Burlington Environmental Technical
Lab No: 29663qc5
Matrix: Soil
Units: ug/kg
Date: February 5, 1993
Dup No: 29663-2

DUPLICATE

Compound	Sample (S)	Duplicate (D)	RPD	FLAGS
Phenol	ND	ND	0.0	
bis(2-Chloroethyl) ether	ND	ND	0.0	
2-Chlorophenol	ND	ND	0.0	
1,3-Dichlorobenzene	ND	ND	0.0	
1,4-Dichlorobenzene	ND	ND	0.0	
Benzyl Alcohol	ND	ND	0.0	
1,2-Dichlorobenzene	ND	ND	0.0	
2-Methylphenol	ND	ND	0.0	
bis(2-Chloroisopropyl) ether	ND	ND	0.0	
4-Methylphenol	ND	ND	0.0	
N-Nitroso-Di-N-propylamine	ND	ND	0.0	
Hexachloroethane	ND	ND	0.0	
Nitrobenzene	ND	ND	0.0	
Isophorone	ND	ND	0.0	
2-Nitrophenol	ND	ND	0.0	
2,4-Dimethylphenol	ND	ND	0.0	
Benzoic Acid	ND	ND	0.0	
bis(2-Chloroethoxy)methane	ND	ND	0.0	
2,4-Dichlorophenol	ND	ND	0.0	
1,2,4-Trichlorobenzene	ND	ND	0.0	
Naphthalene	ND	ND	0.0	
4-Chloroaniline	ND	ND	0.0	
Hexachlorobutadiene	ND	ND	0.0	
4-Chloro-3-methylphenol	ND	ND	0.0	
2-Methylnaphthalene	ND	ND	0.0	
Hexachlorocyclopentadiene	ND	ND	0.0	
2,4,6-Trichlorophenol	ND	ND	0.0	
2,4,5-Trichlorophenol	ND	ND	0.0	
2-Chloronaphthalene	ND	ND	0.0	
2-Nitroaniline	ND	ND	0.0	
Dimethyl phthalate	ND	ND	0.0	

Continued

SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

SEMIVOLATILE ORGANICS PER EPA SW-846 METHOD 8270

Page 2 of 3

Client: Burlington Environmental Technical
 Lab No: 29663qc5
 Matrix: Soil
 Units: ug/kg
 Date: February 5, 1993
 Dup No: 29663-2

DUPLICATE

Compound	Sample (S)	Duplicate (D)	RPD	FLAGS
Acenaphthylene	ND	ND	0.0	
3-Nitroaniline	ND	ND	0.0	
Acenaphthene	ND	ND	0.0	
2,4-Dinitrophenol	ND	ND	0.0	
4-Nitrophenol	ND	ND	0.0	
Dibenzofuran	ND	ND	0.0	
2,4-Dinitrotoluene	ND	ND	0.0	
2,6-Dinitrotoluene	ND	ND	0.0	
Diethylphthalate	ND	ND	0.0	
4-Chlorophenyl phenyl ether	ND	ND	0.0	
Fluorene	ND	ND	0.0	
4-Nitroaniline	ND	ND	0.0	
4,6-Dinitro-2-methylphenol	ND	ND	0.0	
N-Nitrosodiphenylamine	ND	ND	0.0	
4-Bromophenyl phenyl ether	ND	ND	0.0	
Hexachlorobenzene	ND	ND	0.0	
Pentachlorophenol	ND	ND	0.0	
Phenanthrene	ND	ND	0.0	
Anthracene	ND	ND	0.0	
Di-n-butylphthalate	4,000	4,300	7.2	
Fluoranthene	ND	ND	0.0	
Pyrene	ND	ND	0.0	
Butyl benzyl phthalate	ND	ND	0.0	
3,3'-Dichlorobenzidine	ND	ND	0.0	
Benzo(a)anthracene	ND	ND	0.0	
bis(2-ethylhexyl)phthalate	230	ND	200	
Chrysene	ND	ND	0.0	
Di-n-octyl phthalate	ND	ND	0.0	
Benzo(b)fluoranthene	ND	ND	0.0	
Benzo(k)fluoranthene	ND	ND	0.0	
Benzo(a)pyrene	ND	ND	0.0	
Indeno(1,2,3-cd)pyrene	ND	ND	0.0	
Dibenz(a,h)anthracene	ND	ND	0.0	
Benzo(g,h,i)perylene	ND	ND	0.0	

Continued

SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

SEMIVOLATILE ORGANICS PER EPA SW-846 METHOD 8270
Page 3 of 3

Client: Burlington Environmental Technical
Lab No: 29663qc5
Matrix: Soil
Units: ug/kg
Date: February 5, 1993
Dup No: 29663-2

DUPLICATE

ND = Not Detected

RPD = Relative Percent Difference
= $[(S - D) / ((S + D) / 2)] \times 100$

SEMIVOLATILE SURROGATES

Surrogate	Sample	Duplicate	Control Limits	
			Water	Soil
Nitrobenzene - d5	54	44	35 - 114	23 - 120
2-Fluorobiphenyl	79	69	43 - 116	30 - 115
p-Terphenyl-d14	89	82	33 - 141	18 - 137
Phenol-d6	58	50	10 - 94	24 - 113
2-Fluorophenol	52	39	21 - 100	25 - 121
2,4,6-TBP	82	66	10 - 123	19 - 122

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

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MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

Client Name: Burlington Environmental Technical
 Lab No: 29663qc6
 Date: February 5, 1993

SEMI-VOLATILE ORGANICS

COMPOUND	SPIKE (ug/l)	SAMPLE RESULT	CONC MS	% REC	CONC MSD	% REC	RPD	FLAGS
1,2,4-Trichlorobenzene	3,900	ND	2,400	60	2,300	59	1.7	
Acenaphthene	3,900	ND	3,200	80	2,700	68	16.2	
2,4 Dinitrotoluene	3,900	ND	1,700	43	1,200	31	32.4	
Pyrene	3,900	ND	3,400	85	3,100	80	6.1	
N-nitrosodi-n-Propylamine	3,900	ND	2,900	74	3,000	76	2.7	
1,4-Dichlorobenzene	3,900	ND	1,400	36	1,800	46	24.4	
Pentachlorophenol	3,900	ND	2,600	66	2,500	63	4.7	
Phenol	3,900	ND	2,000	50	2,100	53	5.8	
2-Chlorophenol	3,900	ND	1,700	44	2,100	53	22.2	
4-Chloro-3-Methylphenol	3,900	ND	2,100	52	1,800	46	16.0	
4-Nitrophenol	3,900	ND	ND	0	ND	0	0	

RPD = Relative Percent Difference

% REC = Percent Recovery

ADVISORY LIMITS:

	<u>RPD</u>	<u>% RECOVERY</u>
1,2,4-Trichlorobenzene	23	38 - 107
Acenaphthene	19	31 - 137
2,4 Dinitrotoluene	47	28 - 89
Pyrene	36	35 - 142
N-nitrosodi-n-Propylamine	38	41 - 126
1,4-Dichlorobenzene	27	28 - 104
Pentachlorophenol	47	17 - 109
Phenol	35	26 - 90
2-Chlorophenol	50	25 - 102
4-Chloro-3-Methylphenol	33	26 - 103
4-Nitrophenol	50	11 - 114

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

VOLATILE ORGANICS - METHOD 8240

Client Name: Burlington Environmental Technical
Lab Number: 29663qc7
Units: ug/kg
Date: February 5, 1993

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spiked Dup Result (MSD)	Spike Added (SA)	%R	RPD
1,1-Dichloroethene	< 250	4,300	2,400	179	4,900	2,400	204	14.0
Trichloroethene	< 250	2,100	2,400	87.5	2,100	2,400	87.5	0.0
Chlorobenzene	< 250	2,300	2,400	95.8	2,300	2,400	95.8	0.0
Toluene	< 250	2,300	2,400	95.8	2,300	2,400	95.8	0.0
Benzene	< 250	2,000	2,400	83.3	2,000	2,400	83.3	0.0

RPD = Relative Percent Difference
= $[(MS - MSD) / ((MS + MSD) / 2)] \times 100$

% REC = Percent Recovery
= $[(MS - SAMPLE RESULT) / SPIKE] \times 100$

*QC Limits:

	<u>RPD</u>	<u>% RECOVERY</u>
1,1-Dichloroethene	22	59-172
Trichloroethene	24	62-137
Chlorobenzene	21	60-133
Toluene	21	59-139
Benzene	21	66-142

* These are advisory limits only.

CHAIN OF CUSTODY



BURLINGTON ENVIRONMENTAL

210 West Sand Bank Road
P.O. Box 330
Columbia, IL 62236-0330
618/281-7173
618/281-5120 FAX

CHAIN-OF-CUSTODY RECORD

C.O.C. SERIAL NO. 6083

PROJECT NAME <u>ISL P102 91</u>						NO. OF CONTAINERS	TYPE OF ANALYSIS				PRESERVATIVES		REMARKS (CHEMICAL ANALYSIS REQUEST FORM NUMBER IF APPLICABLE)					
PROJECT NUMBER <u>624875 209</u> MAJOR TASK <u>7304</u>							↓	↓	↓	↓	↓	↓						
SAMPLERS <u>J. PALM</u>														↓	↓	↓	↓	↓
LAB DESTINATION <u>SAS</u>																		
SAMPLE NO.	DATE	TIME	COMP	GRAB	SAMPLE LOCATION													
	<u>1/18/93</u>	<u>1315</u>		<u>X</u>	<u>CP 122B-2-4</u>	<u>2</u>	↓	↓	↓	↓	↓							
	<u>1/18/93</u>	<u>1345</u>		<u>X</u>	<u>CP 122B-6-8</u>	<u>2</u>	↓	↓	↓	↓	↓							

RELINQUISHED BY				RECEIVED BY			
SIGNATURE		DATE	TIME	SIGNATURE		DATE	TIME
		<u>1/19/93</u>	<u>9:55</u>			<u>1-19</u>	<u>9:55A</u>
		<u>1-19-93</u>	<u>11:25A</u>			<u>1/19/93</u>	<u>11:25Am</u>
SHIPPING NOTES				LAB NOTES			